

There was less sunshine this August than in August, 1910, the difference being greatest at the coast stations.

LOCAL STORMS.

Thunderstorms occurred at Campo on the 18th, at Eastpark on the 3d, and at Tamarack on the 26th and 28th.

NOTES ON THE RIVERS OF THE SACRAMENTO AND SAN JOAQUIN WATERSHEDS FOR AUGUST, 1911.

By N. R. TAYLOR, Local Forecaster.

Sacramento watershed.—The Sacramento River fell steadily but slowly during the month, and its average stage showed little departure from that usually maintained in August. It was, however, about 1 foot higher than during the corresponding month of 1910. The following average stages from the more important points in this stream are quoted: Kennett, 0.4 foot; Red Bluff, 1.3 feet; Colusa, 1.9 feet; Knights Landing, 1 foot; and Sacramento city, 6.8 feet.

The American River fell slowly, with only 1 foot between the highest and lowest stages. It averaged, at Folsom, 2.5 feet, which is the highest for any August since that of 1907.

The rivers of the Feather-Yuba territory, while considerably higher than during the preceding August, were practically normal. At Marysville the Yuba averaged 7.7 feet, which is 1.6 feet higher than the average of August of 1910. The Feather, at Oroville, averaged 1.5 feet, which is 0.7 foot above that of the preceding August.

San Joaquin watershed.—All streams in the drainage basin of the San Joaquin Valley carried more water than for any August since that of 1907. This was especially so of the San Joaquin River itself below the mouth of the Merced. At Lathrop the river maintained a stage of over 10 feet until the middle of the second decade, and the range at this point, between 13.8 feet on the 1st and 2.3 feet on the 31st, is the greatest that has ever occurred in any summer month since records have been kept. The average stage at San Joaquin bridge, near Lathrop, was 7 feet, which is 6 feet above that of the corresponding month in 1910.

Beginning with about October 1 a new river gage will be established on the Feather River at Nicolaus, which is 1 mile below the mouth of the Bear River, and about 10 miles above the junction of the Feather and Sacramento Rivers.

REFLECTION OF FOG SIGNALS AT POINT REYES LIGHT, CAL.

By JAMES JONES, Observer, Weather Bureau.

Lying directly across the course of coastwise craft, with its steep cliffs and jagged rocks on the south and a long stretch of sand beach on the north, Point Reyes is one of the most dangerous points on the Pacific coast of the United States. It is shrouded in dense fog 111 days out of the year, average for 18 years, and during the months of July and August fog prevails more than half the time. The average number of foggy days for August, the foggiest month, is 19.

During the year ending July 1, 1911, fog was the cause of the American schooner *Annie E. Smale* and the American steamship *Tallac* going ashore on Point

Reyes, and of a disastrous collision between the American steamship *Beaver* and the Norwegian steamship *Selja*, in which the latter was sunk off the same point. Three lives were lost in these accidents, in addition to property worth nearly \$1,000,000. From the evidence at hand it seems that in all of these cases the accidents were due either to inaudibility of fog signals or to inability to properly locate the signals when heard.

In a comprehensive article on "Fog," in the *Climatology of California*, Prof. McAdie points out the importance of any increase in our knowledge of the dispersion and aberration of fog signals, and the accidents previously referred to accentuate the need of experimental work in this direction. If such work has been delayed through underestimation of the extent of variations in audibility due to stratification of the atmosphere, the following description of effects noted here may serve as an incentive to further study of the subject.

On September 1, 1910, the fog signal at Point Reyes was changed from a steam whistle to a compressed air siren, the amplifying horn of which is placed so as to project the sound out over the ocean where there is a free expanse of water with no land or rocks whatever to interfere with the sound waves. Yet, since the installation of the siren, it is not uncommon for a loud, clear echo to be thrown back, from a fraction of a second to eight seconds after the siren sounds; showing that there is a very effective reflecting surface distant from a few feet up to about 4,400 feet from the siren.

The fact that a sharply defined boundary surface between two air columns of different temperatures will reflect and refract sound waves is well known. Now, if the echo in question is due to reflection from such a surface it would indicate the proximity of a mass of air the temperature of which differs from that in which the fog prevails, and it is an observed fact that, so far, in every instance where the echo has been heard the fog has cleared away, at least temporarily, within a short time thereafter, though it may have continued for days before. One of the quickest changes occurred on August 26, 1911. Dense fog came on during the early morning. At 4.38 p. m. the first echo was heard, eight seconds after the blast, which, since the sound must travel out and back again, would locate the reflecting surface at a distance of about 4,400 feet. The signal continued to operate and the echo to be heard until 4.45 p. m., when the fog cleared away in an instant, leaving only a few scattered patches of light fog over the ocean. By 5.20 p. m. the fog had disappeared entirely.

But the main point, which it is the purpose of these notes to emphasize and which should be brought to the attention of mariners, is the effectiveness of these reflecting surfaces in the free air. The echo of the fog signal that comes back from out over the ocean is as clear and sharp as any echo from other surfaces ever noted by the writer. The warning sounds, after suffering such great reflection, must, if heard at all beyond the reflecting surface, be very difficult to detect. Masters of vessels should, therefore, approach with caution dangerous points at which there are fog-signal stations, and Point Reyes in particular. Too much reliance should not be placed in the audibility of the fog signals, for, though heard at a certain distance normally, they may be entirely inaudible even at a much shorter distance under abnormal atmospheric conditions.